What is claimed is:

1. A colorimetric sensor for measuring one or both of the presence and concentration of an analyte, said colorimetric sensor comprising:

a substantially continuous reflective layer;

a detection layer over the reflective layer, the detection layer comprising at least one polymer component, said detection layer being capable of a change in optical thickness upon exposure to said analyte; and

a semi-reflective layer over the detection layer, the semi-reflective layer having an index of refraction different from the index of refraction of the detection layer, wherein at least a portion of the semi-reflective layer is permeable to said analyte.

2. The colorimetric sensor of claim 1, wherein one or both of the reflective layer and the semi-reflective layer comprises a metal.

3. The colorimetric sensor of claim 1, wherein the semi-reflective layer is a substantially continuous layer.

4. The colorimetric sensor of claim 3, wherein the semi-reflective layer has a differential permeability such that the semi-reflective layer has a higher analyte permeability at a first location on an upper surface of the semi-reflective layer and a lower analyte permeability at a second location on the upper surface.

5. The colorimetric sensor of claim 4, wherein the first and second locations form a pattern on the upper surface of the semi-reflective layer.

6. The colorimetric sensor of claim 3, wherein the detection layer comprises a pattern of wells beneath a lower surface of the semi-reflective layer and extending a depth into the detection layer.

7. The colorimetric sensor of claim 3, wherein the semi-reflective layer comprises a single layer of semi-reflective material on an outer surface of the detection layer opposite the reflective layer.

8. The colorimetric sensor of claim 7, wherein the reflective layer comprises a single layer of reflective material.

9. The colorimetric sensor of claim 3, wherein the detection layer further comprises an inorganic material, said inorganic material being (i) blended with the at least one polymer component, (ii) within a given layer containing the at least one polymer component but not blended with the at least one polymer component, (iii) in a layer separate from the at least one polymer component, or (iv) any combination of (i) to (iii).

10. The colorimetric sensor of claim 3, wherein the sensor further comprises a masking layer over at least a portion of the semi-reflective layer.

11. The colorimetric sensor of claim 10, wherein the masking layer is provided as a pattern over at least a portion of the semi-reflective layer.

12. The colorimetric sensor of claim 1, wherein the semi-reflective layer is a discontinuous layer comprising a single layer of semi-reflective islands having at least one dimension greater than 10 μm, and exposed areas between the semi-reflective islands, said exposed areas having a width of at least 1.0 μm.

13. The colorimetric sensor of claim 1, wherein the semi-reflective layer is a discontinuous layer comprising a single layer of semi-reflective islands, and the detection layer contains wells extending a depth into the detection layer.

14. The colorimetric sensor of claim 1, wherein the semi-reflective layer is a discontinuous layer comprising a single layer of semi-reflective islands, and the detection layer further comprises an inorganic material.

15. The colorimetric sensor of claim 14, wherein said inorganic material (i) is blended with the at least one polymer component, (ii) is within a given layer containing the at least one polymer component but not blended with the at least one polymer component, (iii) is in a layer separate from the at least one polymer component, or (iv) any combination of (i) to (iii).

16. The colorimetric sensor of claim 1, wherein the semi-reflective layer is a discontinuous layer, and the detection layer comprises at least two different polymeric components, wherein the polymeric components are (1) blended with one another, (2) within a given layer but not blended with one another, (3) in a layer separate from one another, or (4) any combination of (1) to (3).

17. The colorimetric sensor of claim 1, wherein the detection layer is porous.

18. The colorimetric sensor of claim 17, wherein the detection layer comprises at least one polymer having an intrinsic microporosity.

19. The colorimetric sensor of claim 1, wherein the detection layer comprises two or more polymer components and wherein the optical thickness of each polymer component changes in the presence of a different analyte.

20. The colorimetric sensor of claim 1, wherein the detection layer comprises at least two polymers and wherein the optical thickness of only one polymer changes in the presence of an analyte.

21. The colorimetric sensor of claim 20, wherein the at least two polymers are arranged such that a visible pattern forms when the sensor is exposed to the analyte.

22. The colorimetric sensor of claim 1, wherein the detection layer has a first thickness in a first location of the detection layer and a second thickness in a second location of the detection layer, said second thickness being different from said first thickness.

23. The colorimetric sensor of claim 1, wherein at least a portion of the reflective layer is permeable to said analyte.

24. The colorimetric sensor of claim 1, wherein said sensor is substantially free of said analyte, and either (i) displays a first color or (ii) is colorless when viewed through the semi-reflective layer.

25. An analyte-containing colorimetric sensor comprising:

the colorimetric sensor of claim 1, and

at least one analyte in contact with the detection layer of the sensor,

wherein the analyte-containing colorimetric sensor either (i) displays a second color that is different from a first color displayed by the colorimetric sensor prior to exposure to said analyte, (ii) undergoes a color change from said first color to a colorless condition upon exposure to said analyte, or (iii) undergoes a color change from being colorless to a color-containing condition upon exposure to said analyte.

26. The colorimetric sensor of claim 1, wherein said sensor is substantially free of biological material between said reflective layer and said semi-reflective layer.

27. The colorimetric sensor of claim 1, further comprising molecular receptors in the detection layer.

28. The colorimetric sensor of claim 27, wherein the molecular receptors are selected from the group consisting of calixarenes, cyclodextrins, dendritic polymers, carbon nanotubes, azacrowns, crown ethers, anion chelating agents containing Lewis acid functionality, organometallic metal complexes, porphyrins, metalloporphyrins, peptides, glycopeptides, proteins, antibodies, enzymes, oligonucleotides, nucleic acids, and combinations thereof.

29. An array comprising two or more of the colorimetric sensors of claim 1.

30. The array of claim 29, wherein at least two colorimetric sensors in the array have (i) different detection layer chemistries, (ii) different molecular receptors within separate detection layers, (iii) different detection layer pore size distributions, (iv) different detection layer thicknesses, or (v) any combination of (i) to (iv).

31. The array of claim 29, wherein each colorimetric sensor in the array shares a common reflective layer and comprises a multi-layered film island comprising a stack of layers including (i) a detection layer with a detection layer composition and (ii) a semi-reflective layer with a semi-reflective layer composition.

32. A device comprising:

the colorimetric sensor of claim 1, and

a housing at least partially enclosing the colorimetric sensor, wherein the housing comprises at least one opening positioned above the semi-reflective layer, said at least one opening providing a restricted view of an upper surface of the semi-reflective layer.

33. The device of claims 32, wherein the restricted view allows a view of the upper surface of the semi-reflective layer within an angle of ± 30° from a normal view.

34. A device comprising the colorimetric sensor of claim 1 and a light source.

35. The device of claim 34, further comprising a photo-detector.

36. A method of detecting the presence or absence of an analyte, said method comprising the steps of:

providing the colorimetric sensor of claim 1,

providing a light source,

contacting the sensor with a medium that may contain an analyte, and

monitoring the sensor for a change in optical properties.

37. The method of claim 36, wherein the change in optical properties produces a visible change.

38. The method of claim 36, wherein the medium is a gas.

39. The method of claim 36, wherein the medium is a liquid.

40. The method of claim 36, wherein the analyte permeates through the semi-reflective layer, the reflective layer, or both.

41. A colorimetric sensor for measuring one or both of the presence and concentration of an analyte, said colorimetric sensor comprising:

a substantially continuous reflective layer;

a detection layer over the reflective layer, the detection layer comprising (i) at least one polymer component, (ii) at least one inorganic component, or (iii) both (i) and (ii); and

a substantially continuous semi-reflective layer over the detection layer, the semi-reflective layer having an index of refraction different from the index of refraction of the detection layer and being permeable to said analyte, said sensor being capable of a change in color upon exposure to said analyte.

42. The colorimetric sensor of claim 41, wherein the substantially continuous reflective layer and the substantially continuous semi-reflective layer are each independently single layers.

43. An array comprising two or more of the colorimetric sensors of claim 41.

44. The array of claim 43, wherein each colorimetric sensor in the array shares a common reflective layer and comprises a multi-layered film island comprising a stack of layers including (i) a detection layer with a detection layer composition and (ii) a semi-reflective layer with a semi-reflective layer composition.

45. A colorimetric sensor for measuring one or both of the presence and concentration of an analyte, said colorimetric sensor comprising:

a reflective layer;

a detection layer over the reflective layer; and

a discontinuous semi-reflective layer over the detection layer, the semi-reflective layer having an index of refraction different from the index of refraction of the detection layer, said sensor being capable of a change in color upon exposure to said analyte,

wherein the sensor has at least one of the following features:

(a) the discontinuous semi-reflective layer comprises a single layer of semi-reflective islands having at least one dimension greater than 10 μm, and exposed areas between the semi-reflective islands, said exposed areas having a width of at least 1.0 μm;

(b) the discontinuous semi-reflective layer comprises a single layer of semi-reflective islands and the detection layer contains wells extending a depth into the detection layer;

(c) the discontinuous semi-reflective layer comprises a single layer of semi-reflective islands and the detection layer comprises at least one inorganic component either alone or in combination with at least one polymer component;

(d) the detection layer comprises at least one inorganic component, wherein said at least one inorganic component is (i) blended with at least one polymer component, (ii) within a given layer containing at least one polymer component but not blended with the at least one polymer component, (iii) in a layer separate from a layer containing at least one polymer component, or (iv) any combination of (i) to (iii); and

(e) the detection layer comprises at least two different polymeric components, wherein the polymeric components are (1) blended with one another, (2) within a given layer but not blended with one another, (3) in a layer separate from one another, or (4) any combination of (1) to (3).

46. An array comprising two or more of the colorimetric sensors of claim 45.

47. The array of claim 46, wherein each colorimetric sensor in the array shares a common reflective layer and comprises a multi-layered film island comprising a stack of layers including (i) a detection layer with a detection layer composition and (ii) a semi-reflective layer with a semi-reflective layer composition.